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A Systematic Review of Financial Incentives for Physical Activity: The Effects on Physical Activity and Related Outcomes

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ABSTRACT

The aim of this review is to give an overview of the available evidence on the effects of financial incentives to stimulate physical activity. Therefore, a systematic literature search was performed for randomized trials that investigate the effects of physical–activity–related financial incentives for individuals. Twelve studies with unconditional incentives (eg, free membership sport facility) and conditional incentives (ie, rewards for reaching physical–activity goals) related to physical activity were selected. Selected outcomes were physical activity, sedentary behavior, fitness, and weight. Results show that unconditional incentives do not affect physical activity or the other selected outcomes. For rewards, some positive effects were found and especially for rewards provided for physical-activity behavior instead of attendance. In conclusion, rewards seem to have positive effects on physical activity, while unconditional incentives seem to have no effect. However, it should be kept in mind that the long-term effects of financial incentives are still unclear.

KEYWORDS

cash; incentive; membership; monetary; sport

Introduction

Physical activity is an important determinant of health outcomes including cardiovascular health outcomes, overweight, diabetes, several cancers, mental health, and mortality.[1] Therefore, improving physical activity behavior may have large health consequences on an individual and societal level, especially because physical activity levels are often below standards.[2–4]

Physical activity behavior may be increased by different types of interventions and one possible facet of such interventions is the use of financial incentives. Financial incentives are external sources of motivation that provide financial encouragement for people to behave in a certain way. Besides financial incentives, financial disincentives (negative incentives) may in theory influence behavior.[5] An example of a financial disincentive is penalizing individuals for not reaching physical activity levels. However, such disincentives require strong justification,[6] are less feasible and practical for changing physical activity behavior, and might lead to ethical discussions. We therefore chose to focus our review on financial incentives related to physical activity.

Financial incentives are a variety of incentives, which have an economical value for the receiver. This does not only include cash payments, but also coupons, goods, and services. Using the three components type of yield, probability of yield, and time to yield,[7] incentives can be classified based into direct gifts, credit, lottery, and credit lottery. A direct gift means that the individual receives the yield immediately and always. Credit means that the individual always receives the yield, but receives it later. Lottery or credit lottery means that the individual has a chance lower than 100% to receive the yield being either a direct gift or credit. This structure is a global and theoretical classification of the types of incentives and these differences in the structure of incentives could be important for the effect on behavior. (see further[8])

These financial incentives have shown to positively influence behavior such as retention rate in cohort studies,[9] receipt of recommended vaccination,[10] and attendance at screening.[10] However, these behaviors are simple behavior and consist of just one or a few actions. Changing physical activity is more complex because it needs a change in lifestyle. Research on effects of incentives on more complex behaviors, which are more comparable to physical activity, shows that incentives may positively affect behavior including smoking cessation,[11] weight loss,[12,13] and food and vegetable consumption.[14]

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However, long-term maintenance of these behavioral changes after ending the incentive is still an issue, due to a lack of studies investigating long-term effects as well as a lack of positive results for studies that do investigate the long-term effects.

Physical activity behavior may be affected in a similar way as these complex behaviors. In previous systematic reviews the effects of incentives were investigated and their focus is on rewards for attendance of exercise sessions[15] or rewards for physical activity[16] and their effects on physical activity. Besides a broad range of physical-activity behavior (eg, sports, active transportation, or other daily-life physical activity), other physical–activity–related outcomes such as weight loss, fitness, and sedentary behavior are also important for health. Furthermore, incentives may not only be used as a reward, but also to lower cost of physical activity and thereby stimulating physical activity behavior. Therefore, our review aims to give an overview of the available evidence on physical activity and physical–activity–related effects of financial incentives to stimulate physical activity. Herewith, we do not only focus on rewards for physical activity behavior, but also how incentives may stimulate physical activity if used to lower cost of physical activity behavior. Financial incentives are therefore categorized into unconditional incentives and rewards, which are described below.

With an *unconditional incentive* the incentive is provided always and the yield of the incentive is needed or useful for physical activity of an individual. This category may be seen as strategies to lower costs of physical activity behavior (eg, membership or sport clothing).

With a *reward* an incentive is provided in some conditions (conditional incentive) as a reward for the individual's behavior. In this case, rewards are provided for reaching goals that are related to physical activity (eg, minutes of physical activity, number of steps, number of times sported). Two different variations can be distinguished: (1) incentives for attending physical–activity–related activities and (2) incentives for meeting physical-activity behavior criteria. Performance goals such as time to exhaustion were not considered as physical–activity–related as we use a health perspective instead of a performance perspective.

The purpose of this review is to examine the effects of unconditional incentives and rewards on physical activity behavior and other physical–activity–related outcomes and therefore systematic search of the literature was performed.

Methods

Study design and search strategy

A systematic review was chosen to be the most suitable methodology for this study. Using this method, the effects of financial incentives could be outlined. Taking the heterogeneity of financial incentives and of the different kind of measures into account, no meta-analytic methods will be used.

A systematic search of the literature was performed to find relevant articles that investigate the effect of incentives in physical activity interventions. For this purpose, the databases (Medline and Embase) and a search strategy were selected by a librarian with literature-search expertise. The databases were searched using the same search strategy for the period of January 1, 1980 until March 19, 2013 (to prevent a large bias of due to the year of study execution). A combination of terms for incentives (eg, incentive, access, lottery, voucher, discount, and financial), physical activity (eg, physical activity, exercise, sport, walk, and fitness), and intervention programs (eg, intervention, program, trial, randomized, counseling, and participation) were required to be identified. The complete search strategy can be obtained through the authors.

Identified records were screened by the two authors independently. Potentially eligible articles were selected and disagreement concerning eligibility on full-texts was resolved by consensus. Reviews providing insight in the effects of incentives on physical activity were screened for additional relevant articles.

Study selection

Peer-reviewed articles were selected when describing a randomized trial that investigates the effect of a physical-activity–related incentive on physical activity behavior, sedentary behavior, fitness, weight, or body mass index (BMI). Two forms of physical–activity–related incentives are possible: the unconditional incentive and the reward. The incentive should be aimed at the individual patient and not on a community, company, or health care provider. Furthermore, articles were only selected when it was possible to attribute the difference in effects between groups to the incentive itself and not to other parts of the program, such that the only difference in the content of the compared intervention groups should be the addition of an incentive (and eventually another intervention component that is not expected to influence the selected outcomes). This condition implies that studies comparing "only an incentive" (and no further intervention) with a (no-intervention) "control group" were included, as well as studies comparing "an incentive combined with other intervention components" with "the same intervention components but without the incentive." Studies were excluded when they only investigated the provision of a pedometer, because (despite the fact that this provision could be seen as an incentive) it is not

possible to distinguish the effect of the pedometer as incentive and the pedometer as a device that provides feedback on physical activity. Furthermore, only articles written in English were selected and no restrictions were made on age, gender, nationality, and duration of intervention or follow-up.

Outcome measures

For the outcomes of physical activity behavior, sedentary behavior, fitness, weight, and BMI were both subjective and objective measurements taken into account. Also, physical activity outcomes could range from total physical activity behavior to attendance at physical activity sessions.

Data extraction and risk of bias assessment

Data was extracted using a standardized protocol, which included study design, type of incentive, other intervention components, type of outcome and measurement, and results. The results of the interventions will be described separately for unconditional incentives and rewards. The risk of bias was assessed using the Cochrane Risk of Bias Tool.[17] For each study, the risk of bias was rated low, high, or unclear (not enough information to assess risk of bias) on six domains: The six domains used to assess the risk of bias incorporates selection bias (random sequence generation, allocation concealment), detection bias (blinding of participants, personnel, and outcome assessment), attrition bias (incomplete data), and reporting bias (selective reporting), and other sources of bias. Whereas a high risk of bias seriously weakens confidence in the results, a low risk of bias means that bias is unlikely to alter the results, and an unclear bias raises doubt about the results.

Results

Study selection

Figure 1 shows the flowchart of the systematic search of the literature. 747 records were identified of which 85 were screened on full-text. Eventually, 13 records describing 12 different studies were included.[18–30] Reasons for exclusion on full-text were: no incentive provided ($n = 22$), not able to distinguish the effect of the incentive ($n = 20$), no randomized trail ($n = 12$), and the incentive was not related to physical activity ($n = 10$). Eight reviews giving insight in the effects of physical–activity–related incentives were selected. Studies included in these reviews were screened for additional eligible studies through reference tracking, but no extra studies were found.

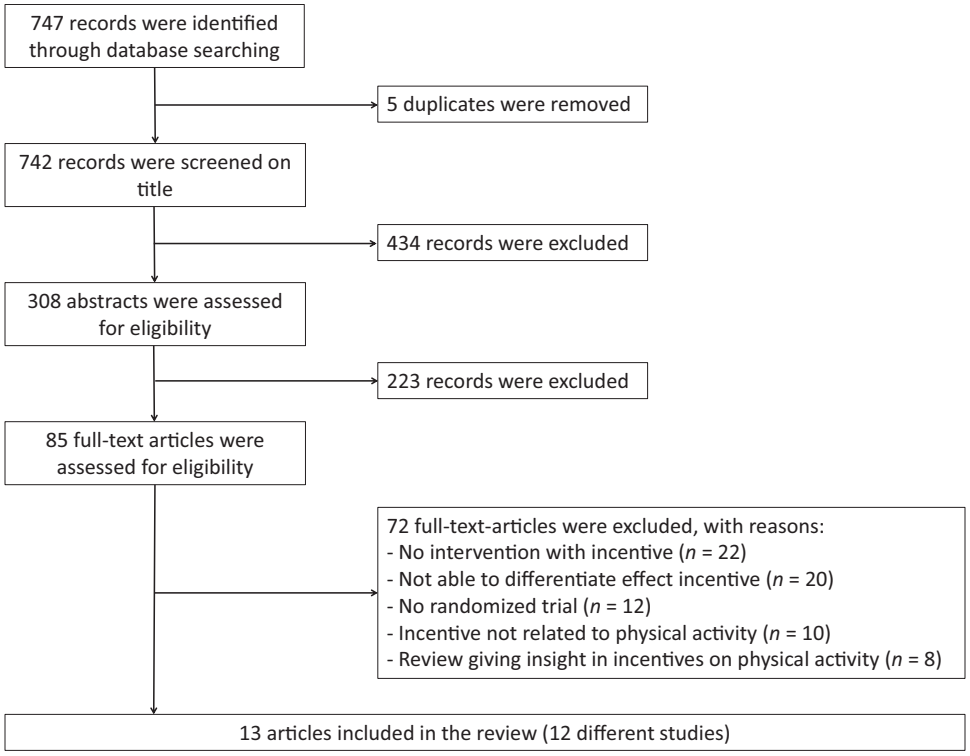

Figure 1. A flowchart describing the systematic search.

Table 1. Overview of the selected studies.

Study	Population	Selected Groups	Setting	Intervention	Duration	Related Outcomes	Measurements
Courneya et al. 1997	Paying members of a university fitness facility, aged 21 to 60 years, with an attendance of 4–11 times in trial month	Reinforcement ($n = 100$) vs Placebo ($n = 100$)	University fitness facility	Both groups received a letter outlining possible activities at the fitness facility. Reinforcement group had an additional paragraph explaining that they could earn a one-month free membership if they attended the fitness facility at least twelve times in the intervention period.	One month	Physical activity	Attendance was monitored
Duggins et al. 2010	Children and adolescents aged 5 to 17 years with a BMI at or above the 85th percentile for age and sex	Treatment ($n = 44$) vs Control ($n = 39$)	Family Medicine Clinics	Participants and their parents or guardians were scheduled to attend four nutrition classes. Treatment group was provided a one-year no-cost family membership to any of six area YMCAs. The first visit was prescribed by a physician. Activities offered at all the YMCAs were aquatics such as swimming and water aerobics, a track for walking or jogging, and weights (for adolescents) in a variety of sizes.	One year	Weight and BMI for-age percentile	Weight and height were measured
Finkelstein et al. 2008	Sedentary adults aged 50 years or older	Treatment ($n = 21$) vs Control ($n = 30$)	Unknown	Participants assigned to the control group were offered a fixed payment of $75 for participation. The treatment group was offered $50 for participation and could earn weekly payments depending on their aerobic minutes. $10 was rewarded if aerobic minutes were on average 15–25 minutes per day. $15 was rewarded for a mean of 25–40 aerobic minutes per day and $25 was rewarded for an average of more than 40 aerobic minutes per day. Aerobic minutes were: continuous walking, jogging, or running at a rate of 60+ steps per minute involving no more than a 60-second pause and lasting ten minutes or longer.	Four weeks	Physical activity	Pedometer
French et al. 1994	Sedentary women	Facility access without self-reward vs No access without self-reward Facility access with self-reward vs No access with self-reward (n-total = 57)	University sports facilities	Classes met for 1h per week at indoor track. Class consisted of brief presentation of various fitness related topics. Optional second half of class was walking or jogging on indoor track. Subjects in self-reward groups were instructed to select an activity to serve as a reward for exercising. Chosen criteria and reward were written in a contract each week. Subjects in access groups received free lockers and passes to university sports facilities for three months (value $20 and $25). This included access to indoor track, weight room, swimming pools, and tennis, squash, and racquetball courts. Other supervised programs for sports and recreational activities were offered for an additional fee.	Incentive for 13 weeks. Measurements at eight weeks and a follow-up at 34 weeks.	Physical activity Physical activity	Self-reported attendance Paffenbarger Activity Questionnaire and physical activity logs

Goldfield et al. 2006/2008	Overweight or obese children aged 8 to 12 years	Intervention ($n = 14$) vs Control ($n = 16$)	Unknown	Children in both groups were provided with feedback by wearing a physical activity monitor. In the intervention group each 30 minutes of physical activity were rewarded with a token that gave 30 minutes television access. Without tokens the intervention group did not have access to the television, while the control group had free access.	Eight weeks	Physical activity BMI Sedentary behavior	Pedometer Measured BMI Past-day physical activity recall
Hardman et al. 2011	School children aged 7 to 11 years	Full intervention ($n = 160$) vs No-reward intervention ($n = 95$)	Primary school	Both interventions were incorporated in the school lessons. Letters, posters, a song, and an activity of the day were part of the program. Children were encouraged to be physical active by peer-modeling characters. Children in both groups received pedometer targets of 1500 steps above baseline level. In the full intervention group rewards were given for each day the participant reached their target. Rewards were inexpensive items such as balls, Frisbees and erasers.	Two weeks rewards, thereafter 14 weeks of tapering without rewards.	Physical activity BMI	Pedometer Weight and height measured
Harland et al. 1999	Adults aged 40 to 64 years	Brief intervention ($n = 105$) vs Brief intervention with incentive ($n = 106$) Extensive intervention ($n = 104$) vs Extensive intervention with incentive ($n = 102$)	General practice	All participants received their baseline health results, leaflets on leisure facilities and activities available locally, and brief advice was given. Participants in the brief intervention groups were offered one motivational interview and participants in the extensive intervention were offered six motivational interviews. Participants in the incentive groups received 30 vouchers (valid during intervention period) that could be exchanged for aerobic activities in leisure center, swimming pool, or other community leisure activities.	Twelve weeks, follow-up at one year	Physical activity	National Fitness Survey Questionnaire
Jeffery et al. 1998	Adults aged 25 to 55 years with 14-32 kg overweight	Supervised exercise and incentive ($n = 37$) vs Supervised exercise ($n = 41$) Supervised exercise, trainer, and incentive ($n = 36$) vs Supervised exercise and trainer ($n = 42$)	Unknown	All participants received behavioral counseling in groups (weekly for 24 weeks, monthly thereafter), supervised walking sessions for three times per week, a caloric goal of 1000 or 1500 kcal/day, and an exercise goal of 1000 kcal/week. Participants in the trainer groups also had a personal trainer assigned, who worked with three or four participants. Participants in the incentive groups received financial rewards based on the number of walks attended. Participants were paid $1 for their first 25 walks, $1.50 for the next 50 walks, $2 for their next 50 walks, and $3 for the remaining walks.	18 months	Physical activity Physical activity Weight	Attendance recorded Paffenbarger Activity Questionnaire Weight was measured

(*Continued on next page*)

Table 1. (*Continued*)

Study	Population	Selected Groups	Setting	Intervention	Duration	Related Outcomes	Measurements
Martin et al. 1984	Sedentary adults	Fixed goals and lottery vs Fixed goals Flexible goals and lottery vs Flexible goals	Private college	Participants met twice weekly with instructors to receive instructions on training and exercise technique followed by 15 to 45 min of brisk walking or jogging. Participants in flexible goal groups were encouraged to modify the daily distance goals according to how they felt that day, while participants in fixed goal groups did not. Lottery groups had a weekly lottery with a small jogging apparel item (such as a t-shirt or sweatband) that was awarded each week to one subject in the group. Larger prizes (e.g. $60 gift certificate at running store) were awarded at the midpoint and endpoint of the program. Chances for each week lottery were distributed in proportion to adherence.	Eleven weeks	Physical activity Physical activity Fitness	Adherence recorded Exercise History Questionnaire 12-min Cooper test
Pope and Harvey-Berino 2013	First-year students at a public university	Incentive ($n = 78$) vs Control ($n = 39$)	Fitness center	Both groups had access to a similar study website and received a goal number of visits, which increased over time (two times 30 minutes in week 1, until five times 30 minutes in week 8, and thereafter). Participants in the incentive group received monetary incentives for reaching these weekly goals, participants in the control group did not. The incentive started with $5 per visit and increased with $0.25/visit each week. If one failed to reach the goal, the incentive was returned to $5 and by reaching their goal in two consecutive weeks, one was returned to where one would be without the non-compliant week	Twelve weeks	Physical activity Weight and BMI	Attendance was recorded Weight and height were measured
Sforzo et al. 2012	Employees	Access-only ($n = 30$) vs Control ($n = 29$)	Mayo Clinic Embody Health portal	For the access-only group, normal fee for membership of fitness facility was waived and 25% discount for healthy meal choices in cafeteria was given. Control group received neither of these.	Twelve weeks	Physical activity Fitness Weight [1]	Mayo Clinic Health Assessment VO_2 measured Weight was measured
Wing et al. 1996	Women aged 25 to 55 with 9–36 kg overweight	Incentive ($n = 21$) vs Control ($n = 16$)	Community center	Participants in both groups had weekly group meetings for 24 weeks and three supervised exercise sessions each week. Participants had an energy intake goal of 1000 to 1200 kcal/day with 20% from fat. Participants of the intervention group who attended a specific walk session were eligible for a drawing of a $50 gift certificate. Also, a final drawing for a $2,000 travel certificate was held, in which chances were based on total number of walking sessions attended.	24 weeks	Physical activity Physical activity Weight	Attendance Paffenbarger Activity Questionnaire Unknown

[1] Weight was not taken into account in this study because an additional food incentive was given that is likely to influence this outcome.

Study characteristics

Table 1 describes the 12 selected studies. The population of these studies mostly consisted of adults; only three studies investigated the effects of financial incentives on children. One study only included women, while others included both male and female participants. Four studies targeted an overweight population, three studies specifically included sedentary individuals, one study included members of a fitness center, and others included a more general population. Interventions were mostly conducted at fitness or health centers, but also a primary school and a general practice were used as setting. The incentives of the interventions were mostly categorized as direct gifts ($n = 8$), while two studies were categorized as credit and two studies as a lottery or credit lottery. Four studies had an unconditional incentive and eight studies used a reward.

The results of the risk of bias assessment are presented in Table 2. The studies mainly had an unclear risk of bias. A few points with a high risk of bias were assessed. These were mainly in the domain of blinding participants, personnel, and outcome assessments. However, the nature of these type of interventions make blinding for participants and staff after treatment allocation very hard and in many cases impossible, since it will always be fairly easy to identify the intervention group(s). Other high risk of biases were found in a study[24] that randomized their participants on school level and in a study[25] that did not report their weight outcome.

Effects of financial incentives

Unconditional incentives

The four interventions with an unconditional incentive consisted of a direct gift of a membership of 12 weeks to one year for a sport facility[19,21,29] or of credit (vouchers) for different kind of activities in one month.[25] In only one study[29] this incentive was compared with a usual-care control group. However, it should be noted that the intervention group did not only receive an incentive for physical activity, but also a discount for healthy food. We expect this food incentive to influence weight and not physical activity. Therefore only physical activity outcome and fitness level were taken into account and not weight outcome. The other three interventions compared the incentive in addition to an intervention with a control group, which received the same intervention only without the incentive. These interventions consisted of four nutrition classes,[19] eight classes on various fitness-related topics and optional exercise,[21] and one or six motivational interviews.[25]

Effects of these interventions are shown in Table 3. None of the studies found an effect of financial incentives on physical activity measured by questionnaires, levels of fitness, or weight and BMI. For attendance at the sport facility, one study[21] did find an effect of the incentive at four weeks after baseline. However, this effect diminished after 8 weeks and at follow-up.

Rewards

The eight studies that used a reward can be divided in five studies that provided an incentive for attending physical activity sessions and three studies that provided an incentive for reaching a physical-activity goal.

The studies with an incentive for attendance provide incentives for reaching goals of attendance at a fitness facility[18] or gym,[28] or provide an incentives for attending walking sessions alone[26,30] or walking/running sessions with instruction classes.[27] The incentives provided are direct gifts of cash or a free membership of a fitness facility, a lottery of jogging items, or a credit lottery of gift certificates. The maximal value of the incentive differed between \$53 to \$527 for direct gifts and from small jogging items to \$2,000 for the lotteries. Three studies compared the incentive in addition to an intervention with a

Table 2. Risk of bias summary.

	Random sequence generation	Allocation concealment	Blinding of participants, personnel, and outcome assessments	Incomplete outcome data	Selective reporting	Other sources of bias
Courneya et al. (1997)	?	?	?	+	?	+
Duggins et al. (2010)	+	+	–	+	?	+
Finkelstein et al. (2008)	?	?	–	?	?	+
French et al. (1994)	?	?	?	?	?	+
Goldfield et al. (2006, 2008)	+	?	–[1]	+	?	+
Hardman et al. (2011)	–	?	?	?	?	+
Harland et al. (1999)	+	?	?	?	–	+
Jeffery et al. (1998)	?	?	?	?	?	+
Martin et al. (1984)	?	?	?	+	?	+
Pope and Harvey-Berino (2013)	+	+	?	+	?	+
Sforzo et al. (2013)	?	?	?	?	?	+
Wing et al. (1996)	?	?	?	?	?	+

Notes: +, low risk of bias; ?, unclear risk of bias; –, high risk of bias.
[1]Participants and intervention were not blinded, but staff that evaluated weight measurements was blinded to the group of the participant.

Table 3. Results of the selected studies.

Study		Incentive		Outcomes					
	Type	Yield	Goal/Meeting Criterion	PA Objective	PA Subjective	PA Attendance	Sedentary Behavior	Fitness	Weight/BMI
Unconditional incentives									
Duggins et al. (2010)	DG	Free 1-year family membership to any of 6 area YMCA (value unknown)	n/a						0
French et al. (1994)	DG	Free 3-month access (lockers (value $20) and passes (value $25)) to university sports facilities	n/a		0	0[1]			
Sforzo et al. (2012)	DG	Free 12-week access to fitness facility (value unknown)	n/a		0			0	
Harland et al. (1999)	C	30 Vouchers for free activity in local authority leisure center, swimming pool, or other voluntary or community leisure activity (value unknown)	n/a		0				
Rewards									
Incentive for attendance									
Courneya et al. (1997)	DG	Free one-month membership at the university fitness facility (value $53)	Goal of attending fitness facility (>11 visits)			+			
Jeffery et al. (1998)	DG	$1–3/walk (maximal value $527 for 234 walks in 18 months)	Attendance at supervised walking sessions		0	+			0
Pope and Harvey-Berino (2013)	DG	$5–$7, $75/visit (maximal value $310.50 for 47 visits in 12 weeks)	Goals of gym visits (2 visits in week 1 increasing to 5 visits in week 8)			+			0
Martin et al. (1984)	L/CL	Weekly lottery of small jogging items (value unknown) and halfway and at the end of the study a lottery of $60 gift certificates for running store	Chances for lottery were distributed in proportion of adherence week's class sessions and outside-of-class run		u[2]	0		0	
Wing et al. (1996)	CL	After specific walking sessions lottery of $50 gift certificates and at last group session lottery of $2,000 travel certificate	Attendance at walking sessions		0	0			0
Incentive for physical activity behavior									
Finkelstein et al. (2008)	DG	$10, $15, $25/week (maximal $100 in four weeks)	Goals of 15, 25, and 40 aerobic minutes per day each week	+					
Hardman et al. (2011)	DG	Daily inexpensive items (eg, balls, Frisbees and erasers; value unknown)	Pedometer targets (1,500 steps more than participants' baseline count)	Incentive period: + After FU: –					0
Goldfield et al. (2006; 2008)	C	Coins for 1 h access to TV (value unknown)	Hours of walking activity	+			+		+

Abbreviations: DG, direct gift; C, credit; L, lottery; CL, credit lottery; PA, physical activity; +, positive effect of incentive; 0, no effect of incentive; –, negative effect of incentive; u, unknown.
[1] Only the first four weeks more visits were made by the facility access groups, but this effect was not maintained in the next four weeks of the study nor during the 6-month follow-up.
[2] At three-month follow-up 40% of lottery subjects were still exercising compared to 35% of the no-lottery subjects (significant difference unknown).

control group, which received the same intervention only without the incentive. These interventions contained 6 and 18 months behavioral counseling and supervised exercise[26,30] and 11 weeks of sessions with lectures, discussion groups, and walking or jogging.[27] The remaining interventions compared an incentive alone with a no-intervention control group.[18,28]

The studies show that a direct gift as well as a lottery or a credit lottery did not influence physical activity measured by a questionnaire, fitness, or weight and BMI (see Table 3). For attendance of the physical activity sessions or visits of sports facilities, no effect was found for studies using a lottery or credit lottery as incentive.[27,30] The studies using a direct gift did find a positive effect of the incentive on attendance. One study showed that the participants with an incentive visited the fitness facility more often than the control group (5.45 vs. 3.77 visits, $p = .003$, effect size $d = 0.38$) during the intervention month.[18] Also, in another study[26] the groups with an incentive attended the supervised walks during the 18-month intervention more often than the comparison groups without an incentive (65.8 vs. 35.0 walks in groups without a personal trainer and 103.4 vs. 80.4 walks in groups with a personal trainer, p value ranged from .02 to .001). Also, a study[28] investigated the number of participants reaching their goal of fitness-center visits. They found that participants in the control group met 5% of their goals, while the incentive group's participants met 63% of these goals ($p < .001$).

The studies investigating incentives for reaching physical-activity-behavior goals used a meeting criterion of mean aerobic minutes per day,[20] daily steps,[24] or hours of walking activity[22,23] to provide the incentive. The incentives provided differ between direct gifts of cash money or inexpensive items of peer-modeling characters and credit of television viewing time. All these studies measured physical activity behavior with a pedometer and compared an intervention group with a pedometer, physical activity goals, and an incentive with a similar group without an incentive.

Results show that all three studies found a positive effect of the incentive on the physical activity measured by a pedometer during the interventions (see Table 3). In one study[20] the group with an incentive had on average 16 more aerobic minutes per day than the control group during the four week intervention ($p < .001$). Another study[22,23] found that the group with incentive (television viewing) had a higher improvement in pedometer counts per day than the control group (+160.8 vs. +33.0, $p = .019$) and in minutes moderate-to-vigorous physical activity per day (+9.4 vs. +0.3, $p = .050$). Furthermore, a positive change in targeted sedentary behavior (television viewing, watching DVD, playing video games) was seen in the intervention group compared to the control group (−116.4 vs. +14.2 min/day, $p = .001$), while other sedentary behavior did not change. In addition, a positive effect of the incentive on weight and BMI was found posttreatment (weight +0.1 vs. +1.6, $p = .044$ and BMI −0.6 vs. +0.3, $p = .037$). Another study[24] found a positive effect of the incentive resulting in more steps per day during the intervention in the group with incentive compared to the control group (2,456 vs. 1,033 steps/day, $p < .001$). In contrast, during the 14 weeks after the intervention also a group effect was found and the control group was more active than the incentive group (2,030 vs. 316 steps/day, $p = .002$). This study found no effects on BMI.

Discussion

This review describes the effects of financial incentives that are related to physical activity. Twelve studies were summarized and these studies show a large heterogeneity due to different settings (community, school, and work), different populations, and different types of incentives. For only a few aspects of these studies a high risk of bias was found, however the risk of bias was largely unclear due to incomplete reporting. Despite that unclear risks of biases are common, it makes that the results should be interpreted with some care. For example, absence of double blinding may enlarge intervention effects with approximately 9%[31] and selective reporting may also lead to overestimations of the actual effects.[32]

Our study suggests that unconditional incentives (ie, an intervention with only free activity) did not affect physical activity or the other selected outcomes. For studies investigating the effect of a reward, more promising results were found and especially for studies with a reward for physical activity behavior. For rewards on attendance, three out of five studies showed a positive effect on attendance, which is in line with a previous systematic review.[15] However, this kind of reward did not result in other physical-activity, fitness, or weight effects. Therefore, it remains questionable whether these rewards for attending exercise sessions have positive health effects, because an increase in exercise sessions does not have to lead to a better total physical activity pattern. The increase in physical activity during these sessions may be compensated during daily life (ie, attending exercise sessions could be compensated by reducing other activities such as active transportation). For rewards on physical-activity behavior instead of only attendance at exercise sessions, the studies showed a positive effect on objectively-measured physical activity.

As mentioned before, the previous systematic review on incentives for physical activity[15] did not incorporate

unconditional rewards. Also, the literature within other complex behaviors does not show this clear distinction between unconditional incentives and rewards. For weight loss and smoking cessation, research only focuses on rewards.[12,13] A likely reason is that for weight loss and smoking cessation an unconditional incentive (eg, free physical activity, healthy food, or nicotine patches) is less directly linked with the outcome than unconditional incentive for physical activity behavior. Comparable to our review, this research on weight loss and smoking cessation found positive short-term effects for rewards. In contrast, research on healthy eating is only focusing on unconditional incentives such as discounts on fruits and vegetables.[14] An explanation is that food-related meeting criteria for a reward (eg, amount of fruit eaten) are often self-reported and therefore less suitable to use as a goal for providing an incentive. Using self-report, participants would be able to intentionally report positive behavior in order to receive the incentive. The research on healthy eating found positive results for unconditional incentives, which is in contrast to our finding for physical activity.

For rewards, it seems that an effect is found on the outcome that is also the goal for the incentive, such that an incentive for attendance results in more attendance and an incentive for pedometer steps results in more pedometer steps. This is supported by a ten-week study that investigated the effects of a financial incentive for attendance at weight-loss sessions and a financial incentive for weight loss.[33] Their results show that an incentive of $20 per week attendance resulted in 3.9 kg weight loss, while $10 per lb weight loss resulted in 9.5 kg weight loss. Thus, positive outcomes are more likely to happen if they are more in line with meeting the criteria of the reward. Therefore, a less direct relation between a physical-activity–related incentive and weight may be expected, because more factors than physical activity play a role in weight reduction. Furthermore, it implies that rewards with meeting criteria that focus on the desired outcome should be used. From the health perspective, it is important to influence physical activity levels in general and using incentives aiming at attendance alone are questionable. For total physical activity levels not only duration is important, but also intensity plays an important role. Therefore, incentives taking into account one or both of these elements, seem more promising. Accelerometers could be used for this purpose, but in the studies in this review only pedometer counts were taken into account. Therefore, future studies should consider using more advanced methods to measure physical activity.

Besides the short-term effects of incentives, maintenance of these effects is an issue. A financial incentive provides extrinsic motivation, which may remove a barrier to adopt new physical activity behavior.[5] However, the focus of the individual may be at the incentive and after ending the incentive this source of motivation is removed. This may lead to a discontinuation of the adopted behavior and could also explain why only short-term effects of financial incentives on physical activity were found. Nevertheless, the external motivation by an incentive may also have a positive influence on internal motivation such as enjoyment and interest. Feedback by rewards and increased sensation of effort by rewards may enhance intrinsic motivation.[34] On the other hand, it has been argued in the past that extrinsic motivations may reduce intrinsic motivation by the controlling aspect of the incentive.[35] Despite the fact that it seems evident to understand how changes in physical activity levels develop after the intervention, the studies included in this review contained little to no information on maintenance of effects. Only one study with a positive effect[24] had a follow-up after receiving the incentive, but during this follow-up the non-incentive part of the intervention did continue. It appeared that the positive effect was not just diminished but turned into a negative effect after follow-up. This shows again the importance of follow-up measurements in research on financial incentives.

This review focused on the effects of incentives and therefore selected studies that compared interventions with financial incentives with interventions without incentives. Consequently, this review shows the possible effects of such an incentive. However, it is much more difficult to compare types of incentives, because there are so many variations possible (as mentioned before) and the type of incentive may change over time. We were only able to compare the two different kinds of incentives (ie, unconditional incentives and rewards) and within these two kinds of interventions no comparison could be made for the types “direct gift,” “credit,” “lottery,” and “credit lottery.” Also, no comparisons between cash and no-cash incentives or other relevant dimensions of the incentive could be made. However, there has been some related research (mainly in the domain of weight loss) to dimensions of incentives that may lead to better effects. Of course, the value of an incentive is important. An intervention comparing incentives of $7 and $14 per 1% weight loss showed that a higher value led to a better result (1.4 kg vs. 2.1 kg weight loss).[36] For time to the incentive, no differences in physical activity were found between immediate (ie, within 2 days) and delayed (ie, at the end of the 8-week program) incentives for weekly completing activities of an Internet program.[37] Furthermore, differences were found for group-based and

individual-based incentives for weight loss.[38] The group-based incentive was $500 per month that was split among participants within a group of five who reached weight-loss goals, while individual-based incentives received $100 for meeting weight-loss goals. After the 24-week intervention, this resulted in more weight loss for participants in the group-based intervention (4.8 kg) than participants in the individual-based intervention (1.7 kg). More research comparing different components of financial incentives is needed to find out what is most effective.

Conclusions

It seems that some physical–activity–related financial incentives have positive, short-term effects, in particular the rewards. From a health perspective, it is recommended to aim incentives on total physical activity behavior including duration and intensity. However, it should be kept in mind that the long-term effects of financial incentives are still not clear and that there is a need for more insight into the effectiveness of different types and components of financial incentives.

References

[1] Physical Activity Guidelines Advisory Committee. *Physical Activity Guidelines Advisory Committee Report*. Washington, DC: U.S. Department of Health and Human Services; 2008.

[2] Troiano RP, Berrigan D, Dodd KW, Masse LC, Tilert T, McDowell M. Physical activity in the United States measured by accelerometer. *Med Sci Sports Exerc*. 2008;40:181–188.

[3] Colley RC, Garriguet D, Janssen I, Craig CL, Clarke J, Tremblay MS. Physical activity of Canadian children and youth: accelerometer results from the 2007 to 2009. *Health Reports*. 2011;22:15–23.

[4] Colley RC, Garriguet D, Janssen I, Craig CL, Clarke J, Tremblay MS. Physical activity of Canadian adults: accelerometer results from the 2007 to 2009. *Health Reports*; 2011;22:7–14.

[5] Jochelson K. *Paying the Patient, Improving Health Using Financial Incentives*. London: King's Fund; 2007.

[6] Martin A, Suhrcke M, Ogilvie D. Financial incentives to promote active travel: an evidence review and economic framework. *Am J Prev Med*. 2012;43:e45–e57.

[7] Fishburn PC. *Utility Theory for Decision Making*. McLean, VA: Research Analysis Corp; 1970.

[8] Kamenica E. Behavioral economics and psychology of incentives. *Annu Rev Econ*. 2012;4:427–452.

[9] Booker CL, Harding S, Benzeval M. A systematic review of the effect of retention methods in population-based cohort studies. *BMC Public Health*. 2011;11:249.

[10] Sutherland K, Christianson JB, Leatherman S. Impact of targeted financial incentives on personal health behavior: a review of the literature. *Med Care Res Rev*. 2008;65:36S–78S.

[11] Volpp KG, Troxel AB, Pauly MV, et al. A randomized, controlled trial of financial incentives for smoking cessation. *N Engl J Med*. 2009;360:699–709.

[12] Volpp KG, John LK, Troxel AB, Norton L, Fassbender J, Loewenstein G. Financial incentive-based approaches for weight loss: a randomized trial. *JAMA*. 2008;300: 2631–2637.

[13] Jeffery RW. Financial incentives and weight control. *Prev Med*. 2012;55:S61–S67.

[14] Waterlander WE, de Boer MR, Schuit AJ, Seidell JC, Steenhuis IH. Price discounts significantly enhance fruit and vegetable purchases when combined with nutrition education: a randomized controlled supermarket trial. *Am J Clin Nutr*. 2013;97:886–895.

[15] Mitchell MS, Goodman JM, Alter DA, et al. Financial incentives for exercise adherence in adults: systematic review and meta-analysis. *Am J Prev Med*. 2013;45:658–667.

[16] Strohacker K, Galarraga O, Williams DM. The impact of incentives on exercise behavior: a systematic review of randomized controlled trials. *Ann Behav Med*. 2013;48:92–99.

[17] The Cochrane Collaboration. The Cochrane Collaboration's Tool for Assessing Risk of Bias. http://ohg.cochrane.org/sites/ohg.cochrane.org/files/uploads/Risk%20of%20bias%20assessment%20tool.pdf.

[18] Courneya KS, Estabrooks PA, Nigg CR. A simple reinforcement strategy for increasing attendance at a fitness facility. *Health Educ Behav*. 1997;24:708–715.

[19] Duggins M, Cherven P, Carrithers J, Messamore J, Harvey A. Impact of family YMCA membership on childhood obesity: a randomized controlled effectiveness trial. *J Am Board Fam Med*. 2010;23:323–333.

[20] Finkelstein EA, Brown DS, Brown DR, Buchner DM. A randomized study of financial incentives to increase physical activity among sedentary older adults. *Prev Med*. 2008;47:182–187.

[21] French SA, Jeffery RW, Oliphant JA. Facility access and self-reward as methods to promote physical activity among healthy sedentary adults. *Am J Health Promot*. 1994;8:257–259, 262.

[22] Goldfield GS, Mallory R, Parker T, et al. Effects of open-loop feedback on physical activity and television viewing in overweight and obese children: a randomized, controlled trial. *Pediatrics*. 2006;118:e157–e166.

[23] Goldfield GS, Mallory R, Prud'homme D, Adamo KB. Gender differences in response to a physical activity intervention in overweight and obese children. *J Phys Act Health*. 2008;5:592–606.

[24] Hardman CA, Horne PJ, Lowe CF. Effects of rewards, peer-modelling and pedometer targets on children's physical activity: a school-based intervention study. *Psychol. Health*. 2011;26:3–21.

[25] Harland J, White M, Drinkwater C, Chinn D, Farr L, Howel D. The Newcastle exercise project: a randomised controlled trial of methods to promote physical activity in primary care. *BMJ*. 1999;319:828–832.

[26] Jeffery RW, Wing RR, Thorson C, Burton LR. Use of personal trainers and financial incentives to increase exercise

in a behavioral weight-loss program. *J Consult Clin Psychol*. 1998;66:777–783.

[27] Martin JE, Dubbert PM, Katell AD, et al. Behavioral control of exercise in sedentary adults: studies 1 through 6. *J. Consult Clin Psychol*. 1984;52:795–811.

[28] Pope L, Harvey-Berino J. Burn and earn: a randomized controlled trial incentivizing exercise during fall semester for college first-year students. *Prev Med*. 2013;56:197–201.

[29] Sforzo GA, Kaye MP, Calleri D, Ngai N. Free choice access to multipoint wellness education and related services positively impacts employee wellness: A randomized and controlled trial. *J Occup Environ Med*. 2012;54:471–477.

[30] Wing RR, Jeffery RW, Pronk N, Hellerstedt WL. Effects of a personal trainer and financial incentives on exercise adherence in overweight women in a behavioral weight loss program. *Obes Res*. 1996;4:457–462.

[31] Pildal J, Hrobjartsson A, Jorgensen KJ, Hilden J, Altman DG, Gotzsche PC. Impact of allocation concealment on conclusions drawn from meta-analyses of randomized trials. *Int J Epidemiol*. 2007;36:847–857.

[32] Chan AW, Hrobjartsson A, Haahr MT, Gotzsche PC, Altman DG. Empirical evidence for selective reporting of outcomes in randomized trials: comparison of protocols to published articles. *JAMA*. 2004;291:2457–2465.

[33] Jeffery RW, Thompson PD, Wing RR. Effects on weight reduction of strong monetary contracts for calorie restriction or weight loss. *Behav Res Ther*. 1978;16: 363–369.

[34] Pierce WD, Cameron J, Banko KM, So S. Positive effects of rewards and performance standards on intrinsic motivation. *The Psychological Record*. 2012;53:4.

[35] Deci EL, Koestner R, Ryan RM. A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychol Bull*. 1999;125:627–668; discussion 692–700.

[36] Finkelstein EA, Linnan LA, Tate DF, Birken BE. A pilot study testing the effect of different levels of financial incentives on weight loss among overweight employees. *J Occup Environ Med*. 2007;49:981–989.

[37] Thompson D, Baranowski T, Cullen K, et al. Food, fun, and fitness internet program for girls: pilot evaluation of an e-Health youth obesity prevention program examining predictors of obesity. *Prev Med*. 2008;47:494–497.

[38] Kullgren JT, Troxel AB, Loewenstein G, et al. Individual-versus group-based financial incentives for weight loss: a randomized, controlled trial. *Ann Intern Med*. 2013;158:505–514.